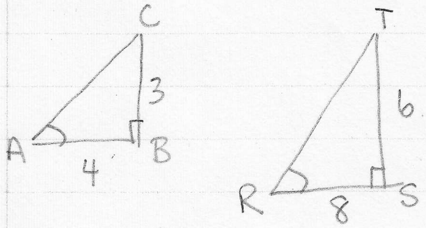
Final Exam Practice Questions - Part 1

1. Are $\angle A = \angle R$ equal



Method #1

$\tan\theta = \frac{opp}{adj}$

$\tan A = \frac{3}{4}$

$\tan A = 0.75$

$A = \tan^{-1}(0.75)$

$A = 36.87°$

$\tan\theta = \frac{opp}{adj}$

$\tan R = \frac{6}{8}$

$\tan R = 0.75$

$R = \tan^{-1}(0.75)$

$R = 36.87°$

$\therefore \angle A = \angle R$

Method #2

$\triangle ABC$

$c^2 = a^2 + b^2$

$c^2 = 3^2 + 4^2$

$c^2 = 9 + 16$

$c^2 = 25$

$c = \sqrt{25}$

$c = 5$

$\triangle RST$

$c^2 = a^2 + b^2$

$c^2 = 6^2 + 8^2$

$c^2 = 36 + 64$

$c^2 = 100$

$c = \sqrt{100}$

$c = 10$

$\frac{RT}{AC} = \frac{RS}{AB} = \frac{ST}{BC}$

$\frac{10}{5} = \frac{8}{4} = \frac{6}{3}$

$2 = 2 = 2$

$\therefore$ Since the $\triangle$'s are similar $\angle A = \angle R$

2. Relation #1

$y = 3x - 6$ ①

Relation #2

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{15 - 5}{6 - 2}$

$= \frac{10}{4}$

$= \frac{5}{2}$

$y = mx + b$

$5 = \left(\frac{5}{\cancel{2}}\right)(\cancel{2}) + b$

$5 = 5 + b$

$5 - 5 = b$

$0 = b$

$y = 5/2\, x$ ②

sub ② into ①

$y = 3x - 6$

$\frac{5}{2}x = 3x - 6$

$\frac{5x}{2} - 3x = -6$

$\frac{5x}{2} - \frac{6x}{2} = -6$

$-\frac{x}{2} = -6$

$-x = -6(2)$

$(-1)(-x) = -12(-1)$

$x = 12$

$y = \frac{5}{2}x$

$y = \frac{5}{2}(12)$

$y = \frac{60}{2}$

$y = 30$

∴ the point of intesection is (12, 30).

Justify

$y = 3x - 6$

$30 = 3(12) - 6$

$30 = 36 - 6$

$30 = 30$

LS = RS

$y = \frac{5}{2}x$

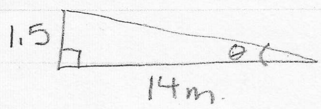
$30 = \frac{5}{2}(12)$

$30 = \frac{60}{2}$

$30 = 30$

LS = RS

3.



$C^2 = a^2 + b^2$

$C^2 = (1.5)^2 + (14)^2$

$C^2 = 2.25 + 196$

$C^2 = 198.25$

$C = \sqrt{198.25}$

$C = 14.08$

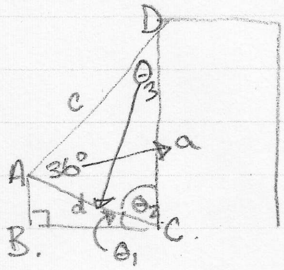
$\operatorname{Tan}\theta = \dfrac{opp}{adj}$

$\operatorname{Tan}\theta = \dfrac{1.5}{14}$

$\operatorname{Tan}\theta_1 = 0.11$

$\theta_1 = \operatorname{Tan}^{-1}(0.11)$

$\theta_1 = 6.28°$



$90° = \theta_1 + \theta_2$

$90° = 6.28° + \theta_2$

$83.72 = \theta_2$

$180° = 83.72° + 36° + \theta_3$

$180° - 83.72° - 36° = \theta_3$

$60.28° = \theta_3$

$\dfrac{a}{\sin A} = \dfrac{d}{\sin D}$

$\dfrac{a}{\sin 36°} = \dfrac{14.08}{\sin 60.28°}$

$\dfrac{a}{0.59} = \dfrac{14.08}{0.87}$

$a = \dfrac{14.08}{0.87}(0.59)$

$a = 9.55m$

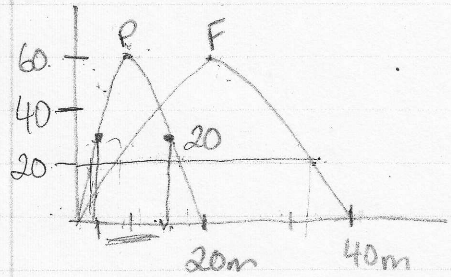
∴ the building is 9.55m tall

4. let jelly beans amount in kg represent x
let Gummi worms amount in Kg represent y

$x + y = 4$

$0.5x + 0.8y = 3$

* Check if 'F'-parabola will be high enough at $x = 1.83$ and $x = 18.17$

5. 

a) The flight paths will be different because while they reached the same max height the landing points are different so one parabola will be wider, compressed, compared to the other. This also means their step patterns will be different.

b) The building has to be narrower rather than wide because both rockets clear the building.

Paulines Parabola

$y = a(x-h)^2 + k$
$y = a(x-10)^2 + 60$
$0 = a(0-10)^2 + 60$
$0 = a(10)^2 + 60$
$0 = 100a + 60$
$\frac{-60}{100} = \frac{100a}{100}$
$-0.6 = a$

$y = a(x-s)(x-t)$
$y = a(x-0)(x-20)$
$60 = a(10-0)(10-20)$
$60 = a(10)(-10)$
$\frac{60}{-100} = \frac{-100a}{-100}$
$-0.6 = a$

$y = -0.6(x-10)^2 + 60$
$20 = -0.6(x-10)(x-10) + 60$
$20 = -0.6(x^2 - 10x - 10x + 100) + 60$
$20 = -0.6(x^2 - 20x + 100) + 60$
$20 = -0.6x^2 + 12x - 60 + 60$
$20 = -0.6x + 12x$
$0 = -0.6x + 12x - 20$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
$= \frac{-12 \pm \sqrt{(12)^2 - 4(-0.6)(-20}}{2(-0.6)}$
$= \frac{-12 \pm \sqrt{144 - 48}}{-1.2}$
$= \frac{-12 \pm \sqrt{96}}{-1.2}$

$x = \frac{-12 + \sqrt{96}}{-1.2} = 1.83$

$x = \frac{-12 - \sqrt{96}}{-1.2} = 18.17$

width $= x_2 - x_1$
$= 18.17 - 1.83$
$= 16.34$ m

6. $y = x^2 + 2x - 8$ Find the zeros

Most Efficient:

$y = (x+4)(x-2)$

$x = -4 \quad x = 2$

check

S $+2$

P -8

I $\underline{+4}, \underline{-2}$

OR

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(2) \pm \sqrt{(2)^2 - 4(1)(-8)}}{2(1)}$$

$$x = \frac{-2 \pm \sqrt{4 + 32}}{2}$$

$$x = \frac{-2 \pm \sqrt{36}}{2}$$

$$x = \frac{-2 \pm 6}{2}$$

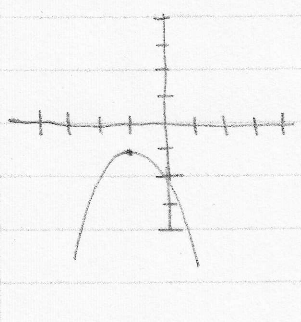
$$x = \frac{-2-6}{2} \qquad x = \frac{-2+6}{2}$$

$$x = \frac{-8}{2} \qquad x = \frac{+4}{2}$$

$$x = -4 \qquad x = 2$$

7. Determine # of zeros $y = -2(x+1)^2 - 1$

method #1



- vertex lies below x-axis
- opens down

$\therefore$ there are no zeros

method #2

$y = -2(x+1)^2 - 1$

$y = -2(x+1)(x+1) - 1$

$y = -2(x^2 + x + x + 1) - 1$

$y = -2x^2 - 2x - 2x - 2 - 1$

$y = -2x^2 - 4x - 3$

$D = b^2 - 4ac$

$= (-4)^2 - 4(-2)(-3)$

$= 16 - 24$

$= -8$

when $D < 0$ there are no zeros.

8. $A(-5,-4)$ $B(5,0)$ equation of $\perp$ bisector is?

$$M_{AB} = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$
$$= \left(\frac{-5+5}{2}, \frac{-4+0}{2}\right)$$
$$= \left(\frac{0}{2}, \frac{-4}{2}\right)$$
$$= (0, -2)$$

$$m_{AB} = \frac{y_2-y_1}{x_2-x_1}$$
$$= \frac{0-(-4)}{5-(-5)}$$
$$= \frac{4}{10}$$
$$= \frac{2}{5}$$

$$\perp m_{AB} = -\frac{5}{2}$$

$$y = mx+b$$
$$-2 = \left(-\frac{5}{2}\right)(0)+b$$
$$-2 = b$$

$\therefore$ the equation of the $\perp$ bisector is $y = -\frac{5}{2}x - 2$.

9. $2x-5y=20$ $\quad x-7y=19^{\times 2}$ $\quad 3x-y=17$

$$\begin{array}{r} \cancel{2x}-5y=20 \\ -\ \cancel{2x}-14y=38 \\ \hline 9y=-18 \\ y=\frac{-18}{9} \\ y=-2 \end{array}$$

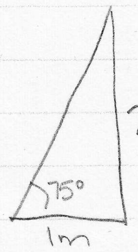
$$2x-5y=20$$
$$2x-5(-2)=20$$
$$2x+10=20$$
$$2x=20-10$$
$$2x=10$$
$$x=5$$

Check

$2x-5y=20$	$x-7y=19$	$3x-y=17$
$2(5)-5(-2)=20$	$5-7(-2)=19$	$3(5)-(-2)=17$
$10+10=20$	$5+14=19$	$15+2=17$
$20=20$	$19=19$	$17=17$
LS = RS	LS = RS	LS = RS

$\therefore$ $(5,-2)$ is the point of inter~~r~~section of all three lines

10.



$\tan\theta = \frac{opp}{hyp}$

$\tan 75° = \frac{x}{1\,m}$

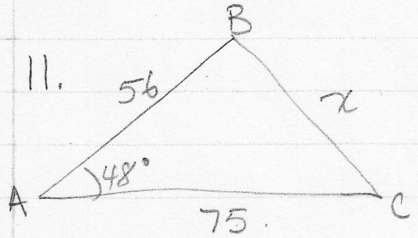
$(\tan 75°)1 = x$

$3.73(1) = x$

$3.73 = x$

∴ the ladder reaches 3.73 m up the wall

11.



SAS ⇒ Cosine Law

$a^2 = b^2 + c^2 - 2bc\cos A$

$x^2 = 75^2 + 56^2 - 2(75)(56)\cos 48°$

$x^2 = 5625 + 3136 - 8400(0.67)$

$x^2 = 8761 - 5628$

$x^2 = 3133$

$x = \sqrt{3133}$

$x = 55.97$